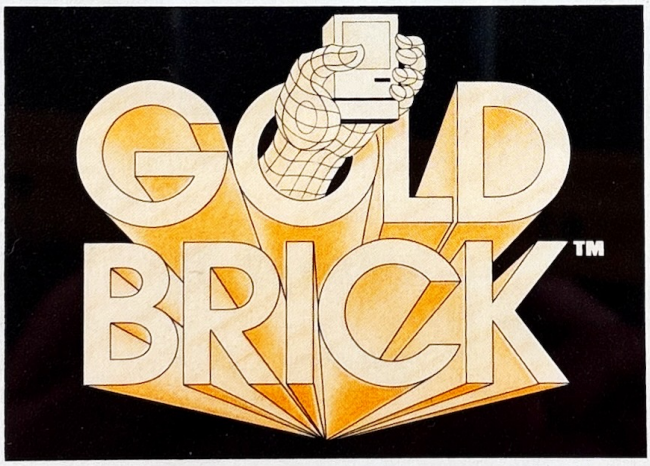
Gold Brick™ Model 2 User's Manual

March 1991



COMPLIANCE WITH FCC REGULATIONS

This equipment generates and uses radio frequency energy and if not installed properly, that is, in accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been designed to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna.
- Relocate the Gold Brick™ or computer with respect to the receiver.
- Move the Gold Brick or computer away from the receiver.
- Plug the computer into a different outlet so that it and the receiver are on different circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful: *How to Identify and Resolve Radio-TV Interference Problems.* This booklet is available from the U.S. Government Printing Office, Washington DC 20402, Stock No. 004-000-00345-4.

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GETTING STARTED

1. Install the hardware—turn off all power, but do not disconnect the machines from the power outlets. Connect the cables from Gold Brick™ 2, The Nugget.

   - The grey cable goes to an **ADB** connector on the back of the Macintosh.
   - The black cable with the large black 7 pin pin-and-socket connector goes to the controller.

   Turn computer power on.

   Notes

   The Gold Brick™ connector occupies the sole ADB input on the new Macintoshes (Classic, SI, and LC). A splitter can be used to allow other devices to also use this input port. These are available commercially or can be ordered from Transfinite Systems Company, Inc. (part no. ADB-2).

   Controller extension cables are commercially available or can be ordered from Transfinite Systems Company, Inc. (part no. NSE-1).

2. Install the software—copy the **Gold Brick™** file (with the hand holding a Macintosh icon) from the Gold Brick diskette to the top level of the System Folder of the disk you will boot from. Re-boot your Macintosh. Gold Brick is now installed.

3. Use your controller as desired. The controller is in default mode; standard controller defaults are given in chapter 3. Chapter 4 explains how to change defaults.

Before Starting to Work

You should copy the Gold Brick diskette and keep the locked original in a safe place. Read the **Read Me** files on the diskette. They are text files designed to be read by **TeachText**; this application is now shipped with all Macintoshes. You can copy these files to your system if you wish.

Using this Book

Throughout this guide we have assumed that you are familiar with the basic Macintosh concepts and operations such as clicking, dragging, windowing, scrolling, and the like. If this is not the case you should read the manual supplied with your Macintosh.

Read Chapter 2 for a general overview of how Gold Brick works.

Read Chapter 3 if you need more details on the operation of the most common controllers and how their outputs are interpreted by the host through Gold Brick.

Read Chapter 4 if you want to change the controller defaults or use an "unknown" controller.

If you are planning to program your Macintosh to make use of additional features of Gold Brick you should order a copy of *The Gold Brick™ Software Reference Manual* (part no. REF-1). It includes information on

- The Macintosh Pointing Device memory structure.
- The Macintosh Serial Driver.
- The ADB interface.
- The Gold Brick Hypercard® interface.

If you want to build your own controller, contact Transfinite Systems Company, Inc. about the availability of a controller construction kit.

Additional Considerations

ADB devices typically draw up to 100 milliamperes and most machines provide only 500 milliamperes of ADB power. It is unwise to try to have more than 4 or 5 ADB devices plugged in at the same time. (Although Gold Brick appears to be two logical devices, it counts as only one physical device.) In addition, Apple Computer recommends against attaching more than four ADB devices in series due to signal deterioration from all the connectors involved. Finally, although the Macintosh Portable is ADB equipped, Apple recommends that only special low power devices be used on it. We recommend against using Gold Brick on a portable.

The Gold Brick software consists primarily of a **cdev** that allows you to define the meaning of the buttons, etc. on your controller. In addition to making a user control interface available via the Control Panel desk accessory, having the **cdev** in place at boot time installs the code to provide the in-memory data structure and driver described in *The Gold Brick™ Software Reference Manual.*

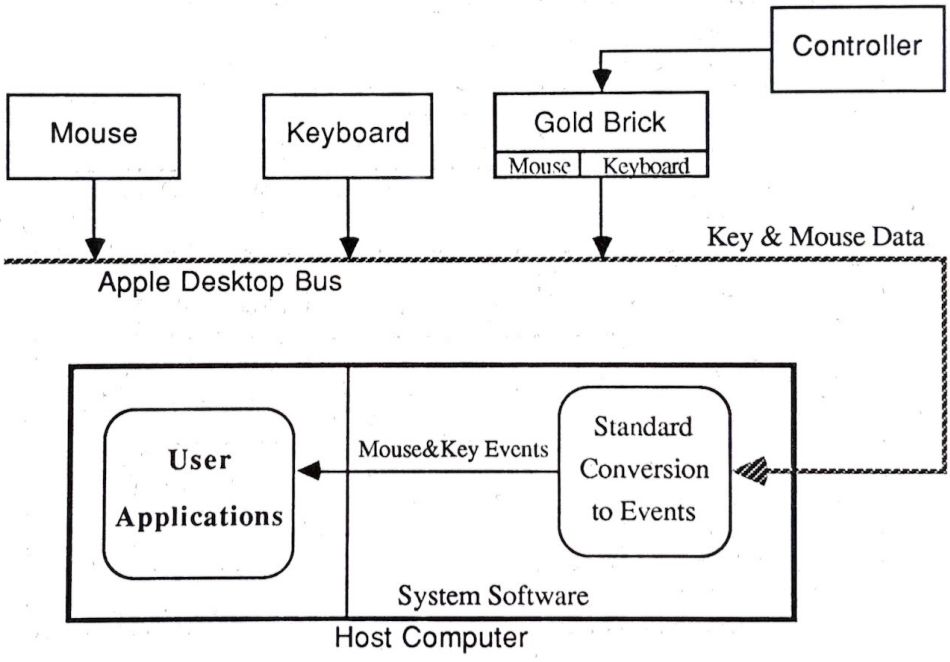
If the **cdev** is loaded during a boot, you will see its icon on the bottom of your screen. The loading of the **cdev** can be suppressed by holding down the mouse button during the boot process. This will cause the icon to appear on the bottom of your screen with a big **X** through it. The **X**'ed icon will also appear if loading of the **cdev** fails due to apparent lack of memory, or if items are missing from the **cdev** file. If the **cdev** load fails, an alert will usually appear at the end of the loading of all INITs with a reason for the failure.

PRINCIPLES OF OPERATION 2

Gold Brick has two fundamental modes of operation illustrated in the diagrams below. (These are general overview diagrams showing the main data flows but not including all details.) The Gold Brick hardware converts signals from Nintendo-compatible controller format to either Mouse and Keyboard format or to its own more complete data format.

Without Gold Brick Software

In this mode, no special software is used on the host computer. Gold Brick looks as if it were an extra mouse and keyboard on the Apple Desktop Bus (ADB). It interprets controller inputs into key and mouse data (see the controller defaults in Chapter 3). This mode works for any ADB-equipped host computer, including the Apple IIGS and works with almost any application software.

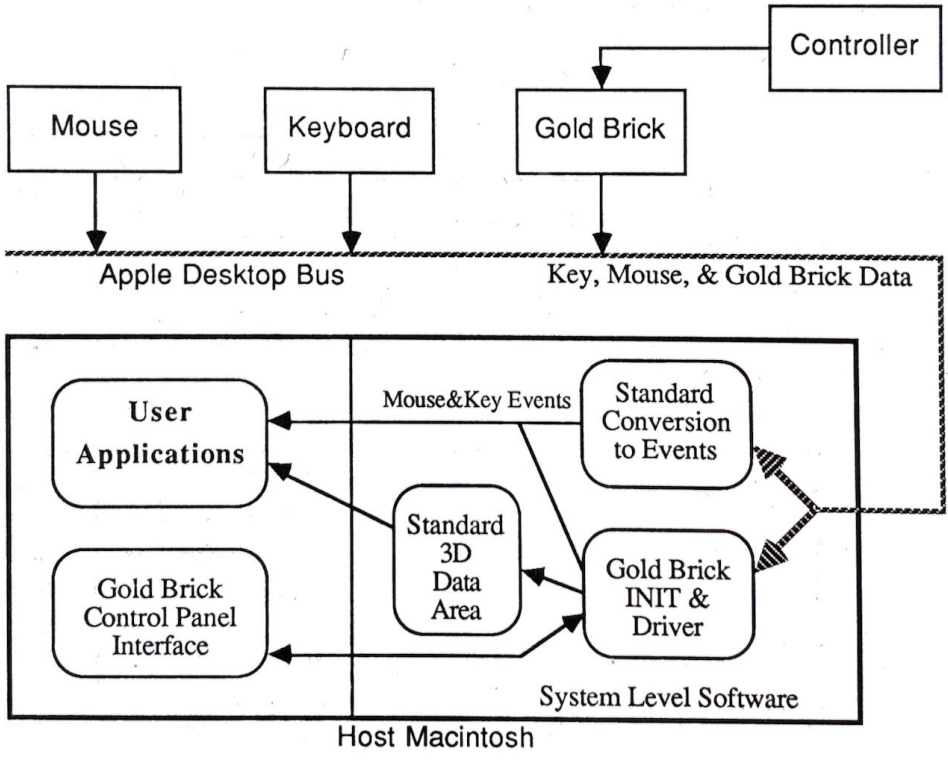


Data Flow Without Gold Brick™ Software

With Gold Brick Software

In this mode, special software run at start-up time sets Gold Brick to send raw controller data down the ADB. This data is then intercepted by resident software. This software can interpret the data not only as key and mouse events but also can update an Apple standard memory area providing for three dimensional input (see Apple Macintosh Developer Technical Note #266) and provide motion-enable and mode-shifting meta functions described in Chapter 4. These are all under the user's control via the Control Panel Interface.

The software-supported mode of Gold Brick operation is also usable by almost any application if you use only key and mouse events. If you with to use the three dimensional input features or make other non-standard interpretation of controller input, your application software will need to understand how to do this.



Data Flow With Gold Brick™ Software

CONTROLLERS 3

There are a variety of controllers that can be plugged into Gold Brick. Generally these are Nintendo Entertainment System® (NES) compatible controllers that fall into the categories below. For each controller a default interpretation is given of the contacts or channels on the controller. This is the mouse/keyboard interpretation that occurs through the Gold Brick hardware if no software is installed on the host computer to which a Gold Brick is connected.

Standard Controllers

This includes the basic controllers supplied with an NES game deck and well as numerous similar and joystick controllers. A standard controller has the following eight controls.

- Start button
- Select button
- A button
- B button
- Up, Down, Left, Right switch (a rocker or similar switch)

Many models also have special **turbo**, **auto-fire**, or **slo(w)-mo(tion)** switches. Using the turbo or auto-fire switch is the equivalent of rapidly pushing the A and/or B buttons; slo-mo is the same as rapidly pushing the Start button. These special switches should be off for use with a host computer through Gold Brick. The default interpretation of a standard controller by Gold Brick is shown in the table below.

Control	Default interpretation
Start	COMMAND
Select	OPTION
A	Mouse button (also the exceptional event for this controller as defined in the ADB protocol)
B	SHIFT
Up	Move mouse up
Down	Move mouse down
Left	Move mouse left
Right	Move mouse right

The Mattel® Power Glove™

The Power Glove requires a special initialization sequence to put it into an extended mode. If not so initialized, the Power Glove appears as a standard controller (see above). Gold Brick automatically performs this initialization sequence on power up. This special initialization can also be performed upon request through the Control Panel interface.

If you plug in a Power Glove after Gold Brick is powered up, Gold Brick will perceive it as a standard controller. There are a number of program options that can be entered with the buttons on the Power Glove (see Mattel's documentation that comes with the glove). These options are part of the non-extended mode.

In the non-extended mode the Power Glove will **not** start sending directional information until you have pushed the **Start** button on the glove. You should also be sure to hit the **7** and **9 buttons** (A off and B off) to turn off its "turbo" feature. You can tell if turbo is on from the flashing A & B indicator lights on the corner sensor box of the Power Glove around-screen ultrasonic sensors.

You can tell if the glove is in the extended mode if the lights on its corner sensor box flicker about 15 times per second (sampling rate). In this mode it provides the following data through the Gold Brick

- A signed byte of X, Y, and Z coördinate information.
- Rotation (but not pitch or yaw) as one of twelve values.
- Bending of the thumb, index, middle, and ring fingers as one of four values.
- Information on what Power Glove button, if any, is being depressed.

Gold Brick receives no indication when the **Prog** button is pushed. Information can only be provided on one button at a time. If more than one button is depressed, the first one in the following list will dominate and any buttons listed after it will appear to be up even if pushed:

⇑, ⇓, ⇒, ⇐, Start, Select, B, A, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, Enter

No two of the arrow buttons (⇑⇓⇒ ⇐) can be pressed at the same time due to the physical construction of the rocker switch.

Finger bending seems to be measured by comparing it with the maximum bending the glove has seen for that finger since it was reset. If the fingers have never been bent, the current position will correspond with the maximum bending seen and they will be reported as maximally bent. You should be sure to clench your fist a couple of times as soon as the glove is initialized on so that bends will be properly measured.

Because of Power Glove built-in features, some buttons have special effects.

The **Center** button can be pushed at any time and will cause the current position and orientation of the glove to be the zero of the coördinate system. The Center button also provides exactly the same indication to Gold Brick that the **0** (zero) number button does.

The **Prog** button stops the transmission of data from the glove. If the **Enter** button is then pushed twice with no intervening button between it and the preceding **Prog**, data transmission will resume. If other buttons are pushed between **Prog** and **Enter**, the glove will generally leave extended mode and may revert to being a standard controller or possibly enter a locked state where it has to be powered off for an extended period to become useful again. Since **Prog** stops all transmission from the glove, it also stops button presses on the glove from being seen. Therefore, we recommend against using the **Prog** button and suggest that the motion enable feature of the control panel interface be used.

The **Start** button is always the exceptional event for a Power Glove as defined in the ADB protocols.

The Gold Brick hardware default interpretation of the glove in extended mode is

Control	Default interpretation
X position	Move mouse horizontally.
Y position	Move mouse vertically.
Z position	ignored.
Index finger	Mouse button.
Middle finger	Shift.
Other fingers	ignored.
Buttons—	
0	ignored
Center	ignored
A	A
B	B
Select	Shift.
1 through 9	1 through 9
Enter	Enter.
rocker switch	same as respective arrow keys
Start	no input generated; treated as the exceptional event.

The glove is continuously active and tends to send motion signals if you relax your arm. Thus, it is a good idea to define one button , such as **Start**, to be a sticky motion enable (see Chapter 4) so motion can be disabled when you are doing something else with your gloved hand.

The Nintendo® Power Pad™

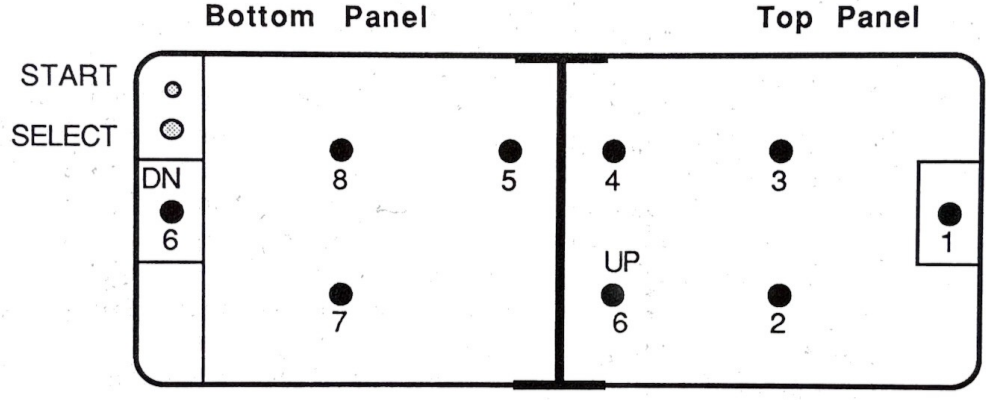
The default interpretation of a Power Pad by Gold Brick is that each of the twelve pads corresponds to the same numbered Function Key on (F1 - F12) on the Apple Extended Keyboard. (Pad 1 is the exceptional event for this controller as defined in the ADB protocols.)

The Brøderbund® UFORCE™

In most of its modes, a UFORCE emulates a Standard Controller as described in the UFORCE manual (see also Standard Controllers above). Gold Brick can distinguish a UFORCE in standard mode and will give it a different controller type number but otherwise treat and interpret it as a standard controller.

If UFORCE game switches 1, 2, and 3 are on, then the UFORCE provides eight channels of analog input and two buttons. (Game switch 4 controls which of two physical sensors is logical sensor 6.) The default interpretation of the buttons is that **Start** is the mouse button (and the exceptional event for this device) and **Select** is shift. Sensors 2 and 7 move the cursor right and left while sensors 3 and 8 move it down and up.

Although the UFORCE is usually used in a right-angle configuration for games, we find that, for Gold Brick use, it is generally better to lay it out flat. This gives more independent access to the sensors.



UFORCE™ Sensor Number Diagram

UFORCE defaults are

Control	Default interpretation
2	Move cursor right
3	Move cursor down
7	Move cursor left
8	Move cursor up
START	Mouse button (and exceptional event)
SELECT	SHIFT

Guns

The Nintendo® Zapper™ (and similar "gun"-type controllers) cannot be used with any model of Gold Brick, including The Nugget. The host cannot sense anything useful about gun input, except possibly the state of the trigger. If connected, Gold Brick will normally classify a gun as an "unknown" type of controller.

MACINTOSH CONTROL PANEL INTERFACE 4

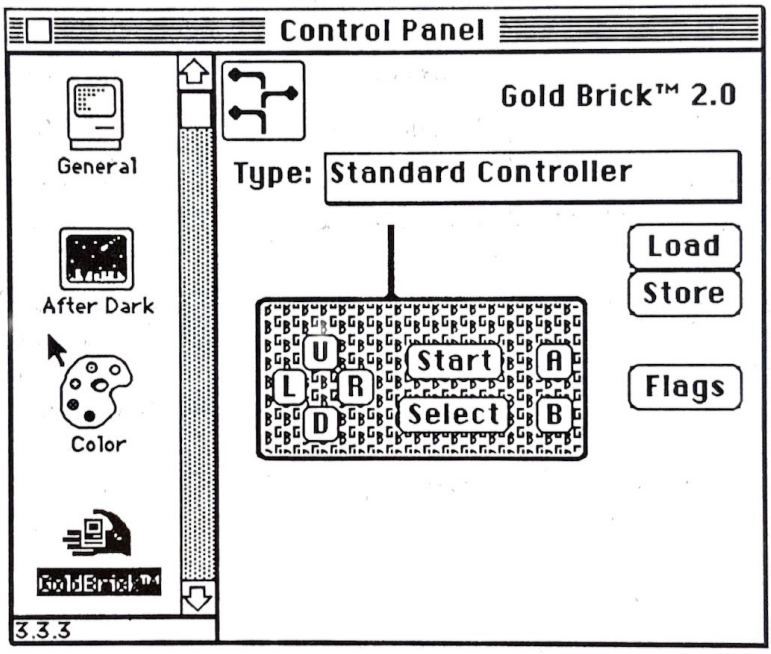
Overview

The Gold Brick **cdev** allows you to

- set how sensors on a controller are interpreted and
- display the status of one or more Gold Bricks on a Macintosh.

Setting Controller Parameters

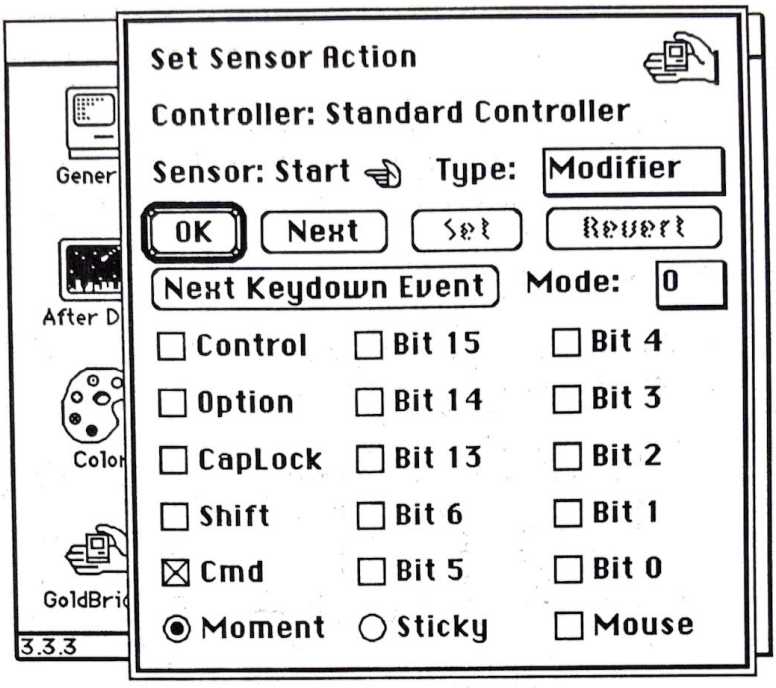
Select **Control Panel** and then **Gold Brick** from the menu. You will get this window (the icons on the left depend upon what you have in your System Folder)—



The default is the **Standard Controller**. If you wish to set parameters for a different controller, hold the mouse button down on **Standard Controller** and then select what you want from the menu. After your controller sensor layout is displayed, click on the sensor whose parameters you want to set. If you click on the controller, rather than on a sensor, it will cycle through the controllers.

After the Set Sensor Action window is displayed, click in the **Type** box to get the sensor interpretation menu; select the one you want. Depending upon your choice you may have to enter additional information. This list below will help you. After you have defined the sensors on your controller you can save this information with the **Store** button. You can use existing stored sensor configurations with the **Load** button. The **Flags** button is explained at the end of this chapter.

A typical window for setting the sensor action is shown below.



With the **cdev** you can assign a meaning to each sensor on a controller (and to each analog channel on any controller that provides analog channels). You can also define "mode" sensors that change the interpretation of other sensors. The possible types of meanings with this release of Gold Brick are:

Ignore
Character
Modifier
Motion
Mode
X or Y or Z
Roll or Pitch or Yaw
Bend

Ignore — This is the most straightforward category; the sensor is ignored.

Character — The sensor is assigned a Macintosh logical key code and an ASCII character code. Activating the sensor causes a Key Down event and releasing it causes a Key Up event. If the sensor is an analog channel, a threshold of 125 out of the possible 0 to 255 range is used. Values above that are considered activations and values below 125 are not considered to be activations.

If you set a sensor to have a key code and a non-zero ASCII value then you will always get exactly that ASCII value and key code in the key down or key up events. However, you may not want to do this. For example, if you define a sensor as **x**, you would usually want to be able to get an upper or lower case **x** by defining another sensor on the controller as a shift modifier. To do this, leave the ASCII value zero and set only the key code corresponding to the physical key. The From Next Keystroke feature gets the key code and ASCII for the next key depressed. As explained above, you may wish to zero the ASCII code.

Modifier — The sensor is assigned any combination of the 16 possible modifers that can occur with each event on the Macintosh. This includes **shift**, **command**, **option**, etc., and also includes the mouse button. The only difference between the mouse button and other modifiers is that changes in the state of the mouse button cause Mouse Up and Mouse Down events to be posted.

Motion — A sensor assigned this meaning acts as an enable for all motion, rotation, and bending sensors. It has the same sort of meaning as putting a mouse on the table top or putting a stylus within proximity of a graphic input tablet.

Mode — Sensors assigned mode meaning can change the meanings of other sensors as described below.

X, Y, or Z — Sensors can be assigned to X, Y, or Z motion. This can be done in two ways, relative and absolute. In both cases, X and Y motion normally cause the screen cursor to also move but an option is provided to decouple the cursor.

RELATIVE motion means that the position along an axis is changed relative to its present position depending on the sensor input. A signed Scale factor and an unsigned "Rise" factor control how the sensor activations translate to motion. For binary sensors, a step is counted many times per second while a sensor is activated. The accumulated number of steps is communicated periodically to the Macintosh by Gold Brick. If "Rise" is set to zero, then the amount of motion is simply the number of steps multiplied by Scale and divided by 128. "Rise" provides a way to let motion start slowly and build up over a short period. The Macintosh software maintains a quantity Q for each type of motion. This quantity is changed to ((Q * Rise) / (Rise+1)) every time input is received from a controller. If the particular direction is active, a change of ((Q+steps) * Scale / 128) is made for a binary sensor. For analog sensors, Q is still maintained but not used and the amount of motion is (value * Scale / 16384) for an analog sensor.

ABSOLUTE motion means that the position along an axis is set depending on the sensor input independent of the old value position. The sensor input is linearly scaled to the value range available on the axis. This mode is usually used for analog inputs as only two positions in the entire axial range would be available for binary inputs. Only the sign of the scale factor is tested. If the scale is negative, the mapping is inverted so that high sensor values result in low axis values and vice versa.

Roll
Pitch
Yaw

Rotation is similar to motion except that the angles maintained for roll, pitch, and yaw by the Macintosh software are folded into the range 0 to 1439 which means they represent quarters of degrees.

Absolute rotation is similar to absolute motion.

Bend

Bending is also similar to the motion sensors. You must specify which "fingers" are to be bent. Absolute bending is similar to absolute motion.

Modifiers, motion, and modes can also be either **momentary** or **sticky**. Momentary means they only have effect when the sensor is being actuated. Sticky means they act like "caps lock" in that they are turned on by one activation and turned off at the end of the next activation. In addition, if an activator is defined as a momentary version of something for which a sticky version exists, the end of activation of the momentary sensor will also clear the sticky version.

The actual processing of an input from a controller involves three passes. First, the sensors/channels are examined for "modes"; the default mode is zero. There can be mode one and/or mode two activators. The mode is one if any mode one assigned sensors are activated. It is mode two if any mode two assigned sensors are activated. It is mode three if both mode one and mode two sensors are activated. The result of this mode scan, including sticky/momentary processing for modes, determines the interpretation of all other sensors. If a sensor is defined in one mode to be a mode sensor then it cannot be defined to be any other kind of sensor in other modes.

The second pass looks for modifiers (including the mouse bit) and motion-enable sensors. Sticky/momentary processing is performed and any mouse down/up event is posted with appropriate modifiers if the mouse button modifier has changed state.

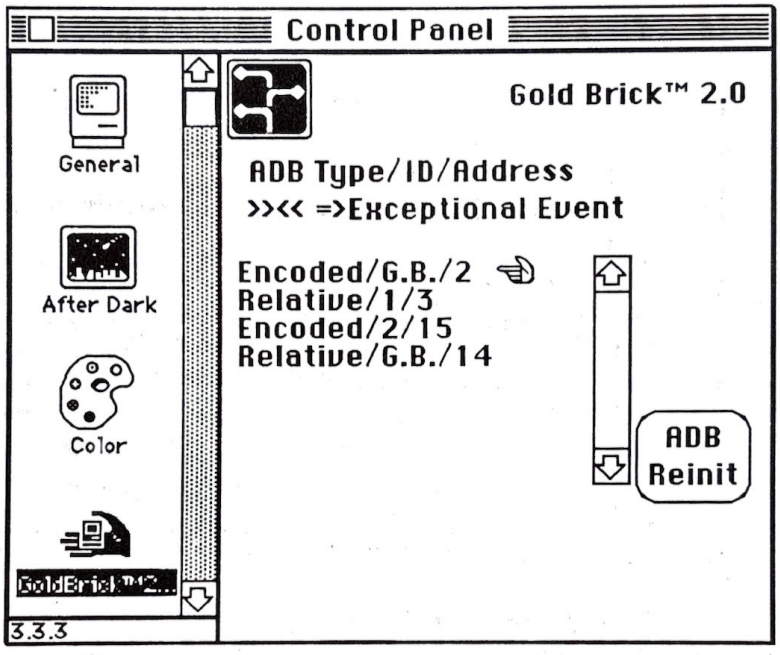
The third pass looks for characters and all types of motions. Motions are processed unless there were one or more motion-enable sensors and none were activated. Key down/up events are posted with appropriate modifiers if the sensors have changed state.

Displaying Gold Brick Parameters

Clicking on the ADB icon in the Gold Brick window switches between "Set Sensor Action" and "Displaying Gold Brick Parameters."

The device type field in this list depends on the initial address for an ADB device. These addresses are assigned by Apple.

The window displaying the Gold Brick parameters is shown below.

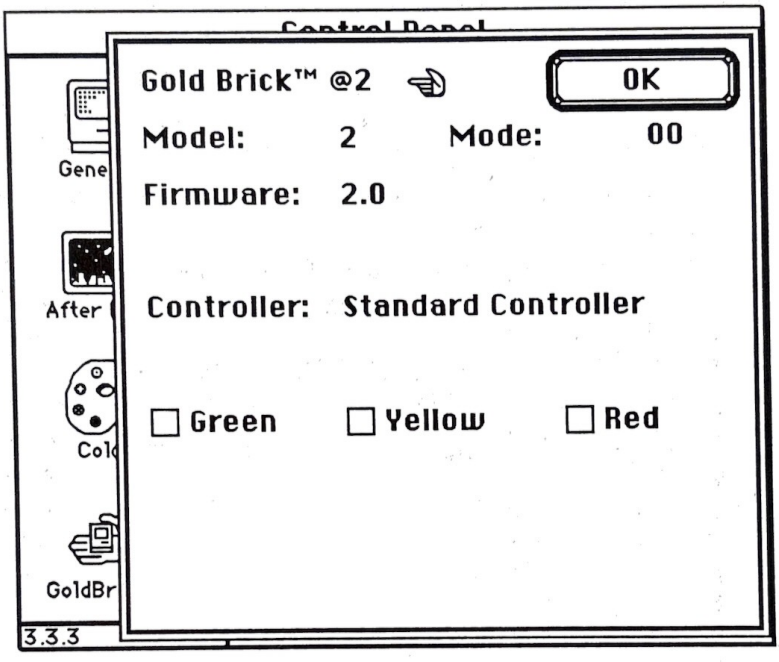


- Devices assigned to initial address 2 are "Encoded" or keyboard devices.
- Those assigned to initial address 3 are generally "Relative" positioning or mouse-like devices.
- Those assigned to initial address 4 are "Absolute" positioning or graphic-table-like devices.
- Those assigned to initial address 7 are miscellaneous "Appliance" type devices.
- Addresses 5 and 6 are reserved.
- Initial addresses 0 and 1 are reserved for devices with extended addressing.

If you double-click on one of the Gold Brick devices listed you will get a new window showing the parameters of that device. It also shows three check boxes that correspond to lights on the Model 1 Gold Brick. Although Model 2 does not have lights, you (or an application program) can still set and read back these control bits.

If you double-click on a non-Gold Brick encoded device, you will get a window letting you turn its lights on and off if your device is an Apple extended keyboard.

If you click on the **ADB Reinit** button, the Apple Desktop Bus will be re-initialized. The list of devices will be refreshed and should reflect any devices that have appeared on or disappeared from the ADB.



Flags

The **Flags** button controls two functions. First, it allows suppression of printing of the Gold Brick icon at the bottom of the screen during startup. Second, it allows you to determine if you want alert boxes to appear on the screen if certain error conditions occur. Normally, these alerts should be enabled.

Boot Time Problems

If your computer hangs very early in the boot process, before any INITs are executed (usually indicated by icons shown across the bottom of the screen), it may indicate a hardware problem with Gold Brick. Try unplugging the Gold Brick unit from the Apple Desktop Bus (ADB) and see if this unhangs the computer.

If you get various bells and X'ed out INIT icons during start up, a possible problem is that Gold Brick is sending a continuous **mouse button down** indication. This could happen, for example, if you have a UFORCE in standard mode that is folded shut. Try unplugging the controller from Gold Brick, re-booting, and plugging the controller back in after the boot process is complete.

Unexpected Response to Buttons

Plugging an ADB device in while the computer is on may cause the ADB to be reset. (Unplugging a device should not effect other ADB devices. The device unplugged, and any devices connected through it, will be reset.) This will reset all devices and they will revert to their default behavior. Gold Bricks will revert to their default mouse/keyboard behavior and, depending on how the boot time ADB address resolution worked out, things may stop working over the ADB or your Macintosh may crash. This is different from plugging a controller into or unplugging it from a Gold Brick. Gold Brick is engineered so that this should not disturb the Gold Brick or other devices on the ADB.

If a Gold Brick gets momentarily unplugged from the ADB, it will revert to simulating an Apple Keyboard and Mouse at their default addresses. You will generally have to reboot to reset things. However, it may be possible to use the Control Panel ADB ReInit button (see Chapter 4) to correct this situation.

If the **A** and **B** buttons on a controller seem to do nothing or to act stangely, it may be that you have some sort of "turbo" or "auto-fire" controller feature turned on. Such features should be turned off for Gold Brick. The same is true of the **Start** button which is frequently defined to be interpreted as the Mouse button. It can be affected by controller "slo-mo" features that should be turned off.

No Response to Buttons

If nothing seems to happen when you manipulate a controller, the most likely thing is that the parameters are not set as you expect. For example, if you expect **Start** to be the mouse button but it seems to do nothing, perhaps parameters are loaded so that the **A** button is the mouse button. If you push up/down/left/right and nothing seems to be happening, those buttons may currently be set to be pitch/yaw or finger bendings which, of course, have no effect on the screen cursor. Possibly you need to hit another button to do a mode shift so they become +/- X&Y. You can use the Control Panel Interface to check the parameters.

The most through way to reset a Gold Brick, as with the rest of your system, is to power it off and on again. Although re-booting should be equivalent to this, there do seem to be rare states that hardware can get into where a power off is the only thing that works to reset it.

Glove Operation Problems

If you get erratic input from a Power Glove, consider the following—

1. The glove must be positioned so the sound from the ultrasonic emitters on the back of your wrist can clearly get to the three receivers around your screen. Do not pitch your hand up (point your fingers up) at all or down much. The Glove can detect only roll (rotation around the axis pointing into the screen), not pitch or yaw.

2. Moving too far horizontally or vertically can product strange inputs. The glove should be within a gently expanding cone starting with the square defined by the three sensors on the screen.

3. Do not attempt to operate two gloves near each other. They use ultrasonic sound and will interfere with each other.

If you get no glove input, remember that you need to push the **Start** button to get input in some modes. When initializing the glove for extended mode, hold the glove so it can be seen by the around-screen sensors. If all else fails, power your computer off and on again with the glove and Gold Brick plugged in.

LIMITED WARRANTY

Transfinite Systems Company, Inc. warrants the hardware portion of this product and the magnetic diskette on which the accompanying software is provided against defects in materials and workmanship for a ninety (90) day period after the original, retail purchase. This warranty does not include damage to the product resulting from accident or abuse. If the product hardware or diskette should become defective within the warranty period, we will repair it or elect to replace it free of charge. We will return your product, tranportation charges prepaid, provided it is delivered prepaid to our offices or designated repair center.

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